WE CLAIM:

1. A system for separating sample molecules having different charges in a plurality of samples, comprising:

   a sample plate comprising a plurality of substantially tubular sample wells arrayed in the sample plate;

   at least one capture matrix, wherein the capture matrix is disposed in each of the sample wells proximate an end of the sample wells, and wherein the capture matrix comprises a diffusion-inhibiting material;

   at least one first electrode in electrical contact with at least one sample well at the bottom end of the sample well, and at least one second electrode in electrical contact with the top end of the sample well, wherein both electrodes are coupled to a power source.

2. The system of claim 1 wherein the sample plate is a rectangular plate measuring 8.5 cm by 11 cm.
3. The system of claim 2 wherein sample plate comprises 96 evenly spaced sample wells.
4. The system of claim 2 wherein sample plate comprises 384 evenly spaced sample wells.
5. The system of claim 2 wherein sample plate comprises 1536 evenly spaced sample wells.
6. The system of claim 1 wherein the first electrode is a flat plate electrode.
7. The system of claim 1 wherein the second electrode comprises an array of pin electrodes.
8. The system of claim 1 wherein the second electrode is a flat plate electrode.
9. The system of claim 1 wherein the second electrode comprises an array of conductive fluid members in electrical contact with at least one electrode.
10. The system of claim 9 wherein the conductive fluid member is a hydrogel comprising a conductive fluid contained within a solid tubular support.
11. The system of claim 9 wherein the conductive fluid member is a hollow solid support containing a conductive fluid, wherein the conductive fluid is separated from the sample of a sample well in the sample plate by a hydrophilic diffusion barrier.

12. The system of claim 11 wherein the hydrophilic diffusion barrier consists of porous glass.

13. The system of claim 11 wherein the hydrophilic diffusion barrier consists of a paper filter.

14. The apparatus of claim 1 wherein the first electrode is integrated into the material of the sample plate.

15. The apparatus of claim 1 wherein the second electrode is integrated into the material of the sample plate.

16. The system of claim 1 wherein the capture matrix further comprises at least two layers of material, wherein the layers comprise at least one diffusion-inhibiting layer consisting of a diffusion-inhibiting material and at least one binding layer comprising a material having the ability to covalently or non-covalently bind at least one molecule of interest, wherein the binding layer is disposed between the diffusion-inhibiting layer and one electrode.

17. The system of claim 16 wherein the binding layer binds the molecule of interest specifically.

18. The system of claim 17 wherein the binding layer comprises an affinity-binding material selected from the group consisting of antibodies, streptavidin and avidin.

19. The system of claim 18 wherein the binding layer binds the molecule of interest non-specifically.

20. The system of claim 19 wherein the binding layer comprises a material selected from the group consisting of metal chelate resins, anionic resins, and cationic resins, polyvinylidine fluoride, nitrocellulose, positively charged nylon, and porous glass.

21. The system of claim 16 wherein the diffusion-inhibiting layer comprises a material selected from the group consisting of cellulose, glass fiber, nylon, porous glass, and hydrogels.

22. The system of claim 21 wherein the capture matrix comprises a hydrogel selected from the group consisting of agarose, polyacrylamide, aminopropylmethacrylamide, 3-sulfopropyldimethyl-3-methacrylamidopropylammonium inner salt, methacrylic acid, 3-sulfopropylmethacrylate potassium salt, glycerylmonomethacrylate, and derivatives thereof.

23. The system of claim 1, wherein the diffusion-inhibiting material is a hydrogel.

24. The system of claim 23 wherein the capture matrix comprises a hydrogel selected from the group consisting of agarose, polyacrylamide, aminopropylmethacrylamide, 3-sulfopropyldimethyl-3-methacrylamidopropylammonium inner salt, methacrylic acid, 3-sulfopropylmethacrylate potassium salt, glycerylmonomethacrylate, and derivatives thereof.

25. The system of claim 1 wherein the diffusion-inhibiting material is a gradient material, wherein a property of the diffusion-inhibiting material varies from the top of the diffusion inhibiting material to the bottom.

26. The system of claim 25 wherein the gradient exhibits a density gradient.

27. The system of claim 25 wherein the gradient exhibits a chemical property gradient.

28. The system of claim 1 wherein the thickness of the capture matrix along the axis of the tubular sample well is less than 0.5 cm.

29. The system of claim 1 wherein the thickness of the capture matrix along the axis of the tubular sample well is less than 0.2 cm.

30. The system of claim 1 wherein the thickness of the capture matrix along the axis of the tubular sample well is less than 0.1 cm.

31. The system of claim 1 wherein the sample plate comprises a plurality of layers of support material, the support material layers comprising a plurality of voids which align to form the plurality of sample wells.

32. The system of claim 31 wherein the capture matrix is a layer of material sandwiched between two support material layers.

33. A method for separating a charged molecule of interest from a mixture of molecules having different charges in a plurality of samples, and quantifying the amount of the charged molecule of interest in the samples, the method comprising the steps of:

(a) dispensing a liquid into the sample wells of the system of claim 1;

(b) adding a sample containing a mixture of molecules to at least two of the sample wells of the device;

(c) applying an electric field across the sample wells by energizing the electrodes, whereby the charged molecule of interest is transported by the electric field into the capture matrix; and

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(d) detecting the amount of the charged molecule of interest captured within the capture matrix.

34. The method of claim 33 wherein the liquid is an aqueous buffer.

35. The method of claim 34 wherein the aqueous buffer is selected from the group consisting of: Tris hydrochloride buffers, Tris borate buffers, histidine buffer, β-alanine buffers, adipic dihydrazide buffers, and HEPES (N-[2-Hydroxyethyl]piperazine-N'-[2-ethanesulfonic acid]) buffers.

36. The method of claim 33 the method further comprising the step of bringing the first and second electrodes of the system into electrical contact with the bottom and top ends of the sample wells.

37. The method of claim 36 wherein the first electrode is a flat plate electrode.

38. The method of claim 36 wherein the second electrode is an array of pin electrodes.

39. The method of claim 36 wherein the second electrode is a second flat plate electrode.

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40. The method of claim 33 wherein the second electrode comprises and array of conductive fluid members in electrical contact with at least one electrode.

41. The method of claim 40 wherein the conductive fluid member is a hydrogel comprising a conductive fluid contained within a solid tubular support.

42. The method of claim 40 wherein the conductive fluid member is a hollow solid support containing a conductive fluid, wherein the conductive fluid is separated from the sample in a sample well in the sample plate by a hydrophilic diffusion barrier.

43. The method of claim 42 wherein the hydrophilic diffusion barrier consists of a paper filter.

44. The method of claim 42 wherein the hydrophilic diffusion barrier consists of porous glass.

45. The method of claim 33 wherein the molecule of interest has a negative charge, the first electrode is biased with a positive charge, and the second electrode is biased with a negative charge.

46. The method of claim 33 wherein the molecule of interest has a positive charge, the first electrode is biased with a negative charge, and the second electrode is biased with a positive charge.

47. The method of claim 33 wherein the detection is by a method selected from the group consisting of fluorometry, colorimetry, luminometry, mass spectrometry, electrochemical detection, and radioactivity detection.

48. The method of claim 33 wherein the detection step is carried out by placing the sample plate in a microtiter plate reader.

49. The method of claim 33 wherein the sample is added to the sample wells by an automated microtiter plate sample transfer device.

50. The method of claim 33 wherein an electric current in the range of 1mAmp to 100,000 mAmp per well is applied across the sample plate to generate the electric field.

51. The method of claim 33 wherein an electric current in the range of 100 mAmp to 5000 mAmp per well is applied across the sample plate to generate the electric field.

52. The method of claim 33 wherein an electric current in the range of 500 mAmp to 2000 mAmp per well is applied across the sample plate to generate the electric field.

53. The method of claim 33 wherein an electric potential in the range of 1V to 1000V is applied across the sample plate to generate the electric field.

54. The method of claim 33 wherein an electric potential in the range of 10V to 500V is applied across the sample plate to generate the electric field.

55. The method of claim 33 wherein an electric potential in the range of 30V to 200V is applied across the sample plate to generate the electric field. useful voltages, more preferably between, and most preferably.

56. The method of claim 33 wherein the sample comprises a mixture of peptides, and the charged molecule of interest is a peptide.

57. The method of claim 56 wherein the peptide of interest comprises a detectable label.

58. The method of claim 33 wherein the charged molecule of interest is the product of a substrate reaction wherein the net charge of a substrate is changed in the enzymatic reaction.

59. The method of claim 57 wherein the charged molecule of interest and the substrate both comprise a detectable labeling moiety.

60. The method of claim 59 wherein the labeling moiety is a fluorescent moiety.

61. The method of claim 57 wherein the method is capable of detecting the enzymatic conversion of at least 10% of the substrate.

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62. The method of claim 57 wherein the method is capable of detecting the enzymatic conversion of at least 1.0% of the substrate.
63. The method of claim 57 wherein the method is capable of detecting the enzymatic conversion of at least 0.1% of the substrate.

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